Transportation Safety Technologies

Using computer modeling to help manufacturers improve transportation safety technologies

Passenger safety and biomechanics

In our studies of vehicle crashworthiness, we are developing methodologies that relate the properties of crash dummies to those of human passengers using finite-element material models. In such models, passengers will be discretized directly with finite elements in the same manner that we now model the vehicle itself. These calculations will be performed either in one analysis or by coupling two analyses. A key issue in such models is to develop material constitutive equation forms (and data) that represent the human body and are also suitable for implementation with the DYNA and NIKE codes.

APPLICATIONS

- *Using finite-element material codes to model the properties of passengers*
- *Improving airbag design*
- *Maximizing the safety and size of environmentally friendly vehicles*
- *Assessing how HIRFs will affect digital electronic systems on airplanes and vehicles*

Air-bag technology

In a project sponsored by the National Highway and Traffic Safety Association (NHTSA), we are also studying ways to improve the technology for deploying airbags. Our goal is to improve the experimental test input so we can design better airbags using calculation techniques.

Auto-computing consortium

We are working with the big three U.S. automakers and other DOE laboratories to enhance several key components of the computer design procedure for crashworthiness. These components encompass improvements to all aspects of crash simulation, such as the speed of generating vehicle finite-element models, the constitutive models for anisotropic material crush and damage, and the visualization techniques to evaluate design performance. With the advent of massive parallel processing methodologies that permit larger finite-element vehicle models, the speed at which quality vehicle models can be generated and evaluated is critical.

Small vehicle safety

Working with CALSTART, a California nonprofit consortium dedicated to developing and commercializing advanced transportation technologies, we are developing the methodologies to model advanced aluminum spaceframe vehicle structures at the local (joint) level and the global (full-vehicle) level. This technology evaluates novel schemes for improved safety in small electric or hybrid vehicles. Computerized models allow us to consider tradeoffs between weight, size, and cost to maximize safety and to overcome the size disadvantage of environmentally friendly vehicles.

Effects of high-intensity radiated fields

Under NASA sponsorship, we are developing and refining techniques to assess the effects of high-intensity radiated fields (HIRF) on digital electronic systems installed on advanced aircraft. For this project, we modified an LLNL code, TSAR, and it is being used in demonstration projects aimed at identifying potential vulnerabilities on typical civil aircraft. We have proposed using this technology to assess HIRF effects on vehicle communications systems.

Availability: Our technology is available now. We welcome discussions with potential partners.

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